ECONOMIC ANALYSIS OF HOME HEATING AND COOLING

HERB WAGERS

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ABSTRACT

Over the last eleven years Houston Lighting & Power has raised utility rates an average of 17% per year. Over the last 3½ years the utility rates have doubled. According to Houston City Magazine, Houstonians can expect future raises of 20-25% annually due to required construction of new utility plants to accommodate Houston's future growth. Utility costs could, and in many cases do, exceed the monthly mortgage payment. This has caused all to become concerned with what can be done to lower the utility bill for homes. In a typical Gulf Coast home approximately 50% of household utility costs are due to the air conditioning system, another 15-20% of utility costs are attributed to hot water heating. The remaining items in the home including lights, toaster, washer, dryer, etc. are relatively minor compared to these two "energy gulpers". Reducing air conditioning and hot water heating costs are therefore the two items on which homeowners should concentrate.

INTRODUCTION

Homeowners can make their homes more energy efficient by adding insulation, caulking around doors and windows, and other conservation measures. The next step is to analyse and select the most efficient heating and cooling system on the market. The next step would be to determine how to significantly reduce the cost for generating hot water for use in your home. This paper will identify the most economical [illegible] efficient system.

The most common air conditioning system consists of a condensing unit located next to the house coupled with an indoor coil. Heat is supplied from either an electric or gas furnace. Due to today's lower cost of natural gas, a gas heating system is less costly to operate than an electric furnace. Currently about the most efficient residential air conditioning unit type has a Seasonal Energy Efficiency Ratio (SEER) of 10. This means that this unit will produce 10 BTU's of cooling for every watt of energy consumed during the cooling season. The most economic common system to operate, therefore, would be a high efficiency gas furnace with a 10 SEER cooling unit.

RESIDENTIAL HEAT PUMPS

Another system that is gaining in popularity is the heat pump. Part of the reason for the increased acceptance of the heat pump is their heating efficiency compared to the electric furnace. In fact the heat pump averages out over the heating season to be twice as efficient to operate as the electric furnace. So if natural gas is not readily available a 10 SEER heat pump would be the most efficient system to operate. The utility companies are encouraging heat pump use since they would help to flatten the load requirements from summer to winter operation, plus the electric company could provide more electrical service in the winter months. An example of HL&P's support of the heat pump is the current HL&P rebate program that offers as much as $500.00 per unit rebate for any system that is rated at 9+ SEER.

GEOTHERMAL HEAT PUMPS

An air conditioning system that appears to be rapidly gaining in popularity is the geothermal heat [illegible] This system simply takes the basic heat pump [illegible] or heat one of the freon coils, whereas, the conventional heat pump utilizes outdoor air to cool or heat this coil. The benefit of using water in lieu of air to exchange heat energy is both the specific heat (energy content) of water versus air and also the constant temperature of water from the earth in this area (approximately 69°F). Air temperatures could range from 15° to 100°F. The resulting efficiencies of these systems are as high as 14 EER on cooling and twice as efficient as the more common heat pump on heating. Therefore, the operating costs for cooling and heating are substantially less (approximately 40-60%) than the conventional heat pump system.

SUPPLEMENTARY HOT WATER HEATING

In addition to the operating cost savings for cooling and heating with the geothermal heat pump a relatively new but proven device, known as a desuperheater, can be installed on the geothermal heat pump which will generate free hot water for the hot water heater. These savings can amount to 80% of the cost of running the hot water heater. For a family of four with an electric hot water heater in Houston this savings could amount to over $500.00 per year at today's utility rates. These desuperheaters could also be applied to more conventional systems but could only be operated during the cooling season. The

savings would not be nearly as great as with the geothermal system.

ECONOMICS OF GEOTHERMAL SYSTEMS

A look at comparative costs of installation of the conventional high efficiency cooling unit and gas furnace or a high efficiency heat pump compared to the geothermal heat pump with a desuperheater system shows a premium of approximately $800.00 per ton of cooling capacity required.

Therefore, a typical home requiring four tons of cooling would have a first cost premium of $3,200.00 over the other high efficiency systems. At first glance this seems to make the geothermal system cost prohibitive. However, if the $3,200.00 premium cost is amortized over the life of the 30 year mortgage at 13% interest the monthly cost for owning the system is approximately $35.00. Since the savings for electric hot water heating alone would be about $500.00 per year, or $42.00 per month, the additional savings of 40-60% for cooling and heating become positive cash flow the very first month the home is occupied. A family of four in a 2500 square foot home can expect an annual net savings for cooling and heating the first year to exceed $600.00. Using the Light Company's projected cost increases of 20-25% per year through the next ten years, the actual savings could accrue to $30,000.00 or a net savings of $3,000.00 annually ($250.00 per month positive cash flow).

Conventional systems require more maintenance (placed outside and operate at higher pressures). Additionally, the life of a geothermal system averages 19 years compared with 10 years for a conventional system. The additional maintenance and replacement savings are estimated at $5,000.00 in 10 years.

In summary, the most important financial decision with regard to a new home purchase might not be just the purchase price, or the interest rate, but whether the home has the most economical air conditioning and hot water heating system available in today's market.